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Kidney transplantation in a patient with aortic bi-iliac endovascular graft case report and literature review

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ABSTRACT

Arterial hypertension is a leading cause of both vascular diseases and chronic renal failure. With the increasing incidence of patients suffering from hypertension, an increasing number of patients with hypertensive vascular disease are reported, namely aortoiliac atherosclerosis and aneurysms, needing kidney transplantation (KT). Staged or simultaneous surgical repair of aortoiliac lesions with KT have long been described and studied. In this report, we discuss the case of a patient with infra-renal abdominal aortic aneurysm, having an endovascular bifurcated aortic bi-iliac stent (EVBAIS) introduced, who underwent a KT 3 months after his vascular surgery without any post-operative complication. This case, as well as other previous studies supports the fact that the presence of an EVBAIS does not contraindicate KT.

1. Introduction

Kidney transplantation (KT) flourished since the 1970s,[1] and despite being technically mastered early on, it started to be particularly successful since the 1990s with the advent of many new, clinically approved, immunosuppressive agents with decreased nephrotoxicity. This has substantially resulted in declining rejection rates and prolonged graft survival.[2] The 3 most common diseases leading to chronic renal failure (CRF) and treated by KT are insulin-dependent diabetes mellitus, glomerulonephritis and hypertensive nephrosclerosis.[2] Moreover, advanced atherosclerosis which occurs in haemodialysis patients can be related to either haemodialysis treatment or CRF.[3] The progression of atherosclerosis lesions is enhanced by arterial inflammation resulting from autoimmune disease.[4] Consequently, long-term dialysis and aortitis are capable of causing aortoiliac occlusive disease. Over the last few years, we have witnessed an increase in the number of patients with vascular diseases who are candidates for KT.[5] We describe, in this paper, the case of a patient who underwent a KT and who had previously undergone an endovascular bifurcated aortic bi-iliac stent (EVBAIS) for an infra-renal abdominal aortic aneurysm. The decisions taken concerning the presence of the endovascular stent, the pre-transplant patient's assessment, and the post-operative course will also be addressed.

2. Patient, materials, and methods

The patient was a seventy-year-old Caucasian male, who was referred to our university medical centre, in December 2007, for KT. His past medical history revealed the presence of an essential arterial hypertension for over 10 years resulting in a hypertensive nephrosclerosis and stable CRF. In June 2007, the patient has undergone a coronary artery bypass grafting (CABG) for 4-vessel-ischemic heart disease with mild mitral valve regurgitation. Consequently, the patient suffered from a severe deterioration of his renal function and started haemodialysis one month after his CABG. During the work-up of his CRF, and because of the occurrence of a 'blue toes syndrome' resulting from cholesterol embolisation, a 5.5 cm infra-renal abdominal aortic aneurysm has been discovered and treated successfully in September 2007 by insertion of an EVBAIS. Besides being a heavy smoker, the patient did not suffer from diabetes or any ischemic cerebrovascular disease. His physical examination was unremarkable except for severe weight loss related to his CRF and recent surgeries. His blood pressure was normal and his femoral and distal pulses were palpable without evidence of any sign of arterial insufficiency including trophic changes, peripheral edema or pain upon exercise. The pre-transplant work-up did not contraindicate the surgery as the echocardiography has showed good systolic function of the left ventricle

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with a grade II/III mitral valve regurgitation and moderate pulmonary artery hypertension with an ejection fraction of 68%. A Magnetic resonance angiography was performed and revealed a patent intra-aortic stent ending distally at the mid common iliac arteries bilaterally with the evidence of a discrete atheroma at the level of the descending thoracic aorta. As for the Doppler ultrasound of the lower limbs, it showed a good arterial perfusion but a decreased venous return.

2.1. Procedure

The transplant was performed in December 2007 after a non-related living donor was identified. The graft was installed into the right iliac fosse using the standard technique. Two arteries were identified in the kidney graft and were reconstructed side-to-side on the back table before doing the anastomoses with the right external iliac vessels distal to the vascular endograft. A bolus of 5000 UI of heparin was given to the patient prior to arterial clamping performed just below the bifurcation of the common iliac artery to prevent any stent thrombosis. The total vascular anastomosis time was 35 min. After the vascular clamps removal, the kidney began to produce urine immediately.

2.2. Course

At anaesthesia induction, the patient received 2 vials of Daclizumab (anti-CD25 antibodies), to which the patient developed an anaphylactic shock and needed resuscitation. This state of shock lasted for some hours after surgery and responded favourably to hydration and adrenaline (epinephrine) intravenous perfusion. However, the post-operative course was uneventful as the serum creatinine level had rapidly dropped to 0.7 mg/dl within 48 h. The patient received cyclosporine microemulsion, mycofenolate mofetil and prednisone as maintenance immunosuppression. Cardiovascular protection was done by giving the patient a continuous intravenous perfusion of 15,000 units/day of heparin started 6 h after the surgery and continued during all his hospital stay. Thereafter, heparin was replaced by baby aspirin and pravastatin given orally. An echo-doppler of the kidney graft was done before the patient's discharge from the hospital which has shown a normal kidney graft with a good renal index of 0.69. Upon discharge from the hospital, the patient had a serum creatinine level of 0.7 mg/dl. The patient was closely followed in the transplant outpatient clinic; his medical condition was stable with excellent renal function and free from any vascular problem related to the endovascular stent or his peripheral emboli which has resolved under proper treatment.

3. Discussion

Kidney transplantation has become the treatment of choice for end-stage renal failure. The pool of potential recipients for KT is increasing continuously and this is related mainly to the fact that CRF and haemodialysis are associated with hypertension and lipid disorders that predispose to accelerated atherosclerosis.[6] Moreover, improved results have extended the indication for renal transplantation to include patients of almost any age group as well as patients with diabetes. As a consequence, we are facing an increasing number of patients suffering simultaneously from end-stage renal disease and aortoiliac atherosclerotic and aneurysmal diseases[7] which require surgical repair of atherosclerotic arteries. This increasing combination had caused problems regarding the operative strategy and indications for aortoiliac reconstruction and KT.[8] Some authors recommend that aortoiliac angiography should be performed as a routine before KT in the high age recipients, mainly over 40 years of age, because it often provides the surgeon performing the transplantation with valuable information.[5,9] This attitude is not endorsed by many surgeons since angiography is an invasive procedure and involves patient's exposure to irradiation. Moreover, as vascular disease is a systemic entity, aortoiliac atherosclerosis or aneurysm may be one of the vascular events that the patients suffer from. In a Norwegian study conducted by Brekke et al., it was recommended that special attention needs to be given to coronary atherosclerosis when evaluating aortoiliac patients for KT.[9] Ischemic heart disease, in case not addressed, may put the eligibility of KT in question.

Therefore, aortoiliac reconstruction as preparation for KT is advocated when atherosclerosis of a degree that may preclude transplantation is found.[9] Regarding the timing of the 2 procedures, there was a dilemma between the one-stage and the simultaneous procedure. However, clear recommendations concerning the timing of each procedure with respect to the other in terms of morbidity and mortality, cannot be formulated in view of the limited number of patients and the short follow-up period.[5] For some authors, the morbidity and mortality rates seem to be higher among patients who underwent one-stage procedures but the difference was not statistically significant.[9–14] Wright et al.[14] listed several advantages including easier dissection for implantation of the kidney graft, good immediate vascularisation of the kidney graft, reduced operative risk, elimination of the need for post-operative dialysis and lower cost when only one procedure is performed. According to Piquet et al.,[13] aortic aneurysms should be treated separately because the long duration of one-stage procedures increases the risk of morbidity presumably of anaesthesia and infection. Conversely, these authors state that chronic occlusive lesions can be treated in the same procedure as this does not result in a significant increase in operating time, and the risk of infection of the prosthesis is not increased by immunodepression to control rejection in the immediate post-operative period. According to them, the minimum interval between procedures using the two-stage approach is 6 weeks[13] or 3–6 months.[11] The most comprehensive study on this subject is the multicenter French study conducted by Pittaluga et al.[8] in 1996 where 83 patients who underwent both aortoiliac reconstruction and KT were enrolled. In this survey, the outcome of KT was comparable regardless of whether the procedure is performed alone or in association with aortoiliac reconstruction. One out of 36 patients, who had undergone staged conventional aortoiliac repair and KT, suffered a post-operative iliac artery occlusion proximal to the transplanted kidney. This finding indicates that KT should be performed in patients presenting indications for prior aortoiliac reconstruction.

In 1994, the first endovascular placement of a bifurcated aortic stent graft was reported by Scott and Chuter.[15] As a result, endovascular techniques have rapidly become more common, with many advantages over the standard laparotomy, including decreased morbidity and operative time with a primary success rate of 87%.[16–18] However, their role in the management of abdominal aortic aneurysm has remained controversial regarding their long-term results. Recently, Brewster et al.[19] as well as other authors[23] demonstrated that endovascular techniques using contemporary devices are safe, effective and durable with low mortality rate. Based on these results, EVBAIS has started to be performed routinely in kidney transplant recipients suffering from abdominal aortic aneurysm with satisfactory outcome.[20] The first reported case of KT in a patient with an EVBAIS was conducted by George et al.[21] who was successful, with respect to the patient's renal function and vascular pathology, after one year of follow-up. However, further studies are needed to evaluate the long-term morbidity and mortality as well as issues relevant to the endovascular graft. One major concern unique to these grafts is that of dislodgment or

migration of the graft. Dislodgment that can result in proximal leaks thereby worsening the aneurysm is a recognized potential problem with endovascular grafts.[16,21] Another concern involves the occlusion of the graft or distal iliac artery after KT proximal to the site of anastomosis resulting in insufficient kidney perfusion. Other concerns include retroperitoneal inflammation or fibrosis stemming from renal transplantation after endovascular repair.[15] Finally, the possibility of direct anastomosis to the endoluminal graft has to be addressed.[21] Sterioff et al. showed, as early as 1974, that KT was possible in patients with arterial prosthetic grafts; the artery of the transplant can be anastomosed directly to the graft.[22]

In conclusion, KT in patients presenting aortoiliac disease treated by endovascular grafting is a new entity. Our limited experience, as well as of others[21,23] suggests that the presence of an EVBAIS does not preclude KT. In contrast, through the improvement of the iliac vessels status by using either the EVBAIS or the open aortoiliac bypass, KT can be performed safely. Several challenges and advances wait vascular and transplant surgeons in this respect.

Conflicts of interest

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Ethical approval

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